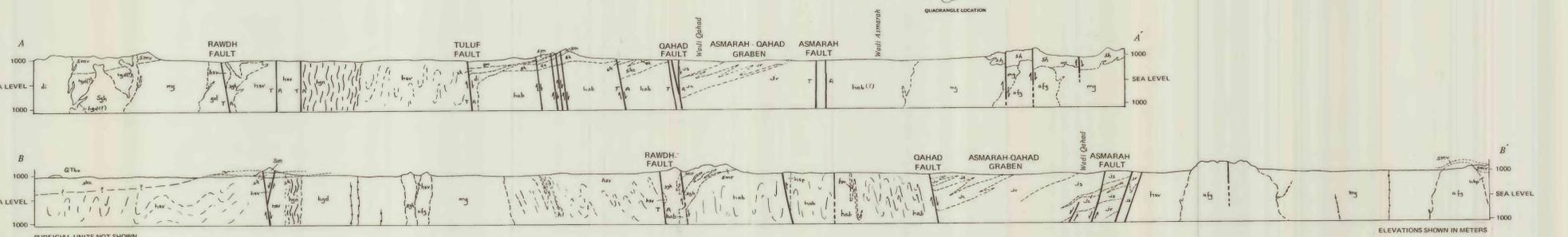




- SYMBOLS**
- CONTACT--Dashed where approximately located, dotted where concealed
 - FAULT--Arrows show relative strike-slip movement; ball-and-bar on downthrown side, where known; hatchures in zones of strongly broken rock; dashed where approximately located, dotted where concealed
 - SHEAR ZONE
 - THRUST FAULT--Sawtooth on upper plate; dashed where approximately located
 - ANTICLINE--Showing trace of axial plane and direction of plunge
 - SYNCLINE--Showing trace of axial plane and direction of plunge
 - STRIKE AND DIP OF BEDS
 - Inclined--showing dip
 - Vertical
 - STRIKE AND DIP OF FOLIATION
 - Inclined--showing dip
 - Vertical
 - ALTERED ROCK--Hydrothermally altered rock
 - WELL--Dug along shear zone
 - ANCIENT MINE OR PROSPECT
 - MEASURED SECTION
 - FELSIC DIKE
 - MAFIC DIKE
 - DIKE
 - TOWN OR VILLAGE

Aerial photography 1956; controlled mosaic 1959; Aero Service Corp., Philadelphia, Penn., U. S. A.
 This report has not been edited or reviewed for conformity with U.S. Geological Survey standards and nomenclature.
 Geology mapped in December 1983 and January 1984
 SCALE 1 : 100 000
 DATUM IS MEAN SEA LEVEL



CORRELATION OF MAP UNITS		DESCRIPTION OF MAP UNITS	
<p>PLUTONIC ROCKS</p> <p>ry</p>		<p>SEDIMENTARY, VOLCANIC, AND METAMORPHIC ROCKS</p> <p>Qa Qs Qsa Ql Qld Qso QThy QTbc</p> <p>QUATERNARY</p> <p>Qa Qs Qsa Ql Qld Qso</p> <p>TERTIARY AND QUATERNARY</p> <p>QThy QTbc</p> <p>UNCONFORMITY</p> <p>sm stw</p> <p>PROTEROZOIC</p> <p>gk skc hgn</p> <p>JIBLAH GROUP</p> <p>fr/jh</p> <p>SEDIMENTARY ROCKS, UNDIVIDED</p> <p>js</p> <p>CONGLOMERATE</p> <p>hc</p>	
<p>SHAMMAR GROUP</p> <p>sm stw</p> <p>KUARA FORMATION</p> <p>sk skc</p> <p>HULAYFAH GROUP</p> <p>gns hgn</p> <p>SEDIMENTARY ROCKS UNDIVIDED</p> <p>hsv hi hab hrm hls hsp</p>		<p>SEDIMENTARY, VOLCANIC, AND METAMORPHIC ROCKS AND ADJACENT OVERBANK AREAS; INCLUDES LOCAL ACCUMULATIONS OF LOCAL SAND AND SILT. THICKNESS 0-15 m</p> <p>SEBKHA DEPOSITS--Clay and silt deposited in flat catchment basins and closely associated with wadi channel deposits. Commonly associated with calcite, gypsum, and saline minerals. Thickness 0-5 m</p> <p>WADI AND SEBKHA DEPOSITS, UNDIFFERENTIATED--Sand, silt, and clay deposited in broad, flat areas containing braided wadi channels that include generally small, flat areas of sebkha deposits</p> <p>ALLUVIAL FAN AND LAG DEPOSITS--Thick deposits of sand, silt, and clay flanking mountainous areas only in the eastern part of the map area; sand probably derived from deflation of Wadi Asmarah</p> <p>AEOLIAN SANDS--Isolated deposits of well-sorted, quartz-rich, wind-blown sand adjacent to mountainous areas only in the eastern part of the map area; sand probably derived from deflation of Wadi Asmarah</p> <p>OLDER ALLUVIUM--Coarse sand and gravel deposits that stand slightly above the adjacent wadi channels; includes thin gravel and pebble lag deposits on bedrock surface that have been beveled by fluvial erosion of adjacent wadis; locally includes colluvial deposits along Wadi Asmarah and Wadi Qahad</p> <p>OLIVINE BASALT--Black, olivine basalt flows that are part of the Harrat Khaybar which flowed eastward, along existing wadi channels, into the western part of the map area. Includes at least two flow units, QTbc and overlying QThy. Thickness 2-10 m</p> <p>SILICIC VOLCANIC AND CLASTIC SEDIMENTARY ROCKS--Pinkish-tan to maroon, rhyolitic to rhyodacitic, crystalline ash flows interlayered with pink, pale-green, and maroon, coarse-grained lithic sandstone, volcanic pebble conglomerate, minor limestone, quartz-rich sandstone, and sedimentary breccia; locally associated with coarse volcanic breccia (B)</p> <p>SEDIMENTARY ROCKS, UNDIVIDED--Red to tan, pebble to cobble conglomerate. Fine- to coarse-grained sandstone, shale, silty limestone, and gray, oolitic to stromatolitic limestone; all rocks are associated with bright red secondary Jasper</p> <p>CONGLOMERATE--Reddish-tan, loosely cemented pebbles, cobbles, and boulders, as much as 0.5 m in diameter, composed mainly of rhyolitic volcanic rocks, alkali-feldspar granite, red granophyre, and lesser amounts of andesite, basalt, and volcanic breccia; locally interlayered with coarse-grained, poorly sorted, subangular lithic sandstone</p> <p>MALHA FORMATION--Red-brown to purplish-red rhyolitic to rhyodacitic, less commonly andesitic, well-layered ash-flow tuff; interlayered with minor pebbly conglomerate, fine- to coarse-grained sandstone, and siltstone. Stands as low hills showing well-developed beach and bluff topography that reflects the well-layered, thin volcanic flows and alternating sedimentary sequences (sm); changes facies in brown- to red-brown, massive, cliff-forming rhyolite to rhyodacite with phenocrysts of quartz, plagioclase and potassium feldspar, generally weakly developed layering it defined by flame in densely welded, partly recrystallized flows. Exposed in west-central part of map area are associated with minor cobble conglomerate, volcanoclastic sandstone, and shale. Exposed in mountainous areas where steep slopes and cliffs reflect the massive character of the flows (smv)</p> <p>Upper member--Interbedded, greenish cobble conglomerate, red lithic to quartz sandstone, laminated purple to maroon shale, and pale-green to orange-red sandstone and shale; locally interlayered with thin rhyolitic flows</p> <p>Lower member--Green to brown, massive to poorly cemented cobble conglomerate; well-sorted clast, generally 1-2 cm in diameter, but locally as large as 1 m in diameter consist mainly of granodiorite, gabbro, and andesitic to basaltic, less commonly rhyolitic, volcanic rocks; interlayered with coarse-grained, poorly sorted, lithic sandstone as much as 10 cm thick</p> <p>ONEISS AND MEGMATTIE--Pale-green, metamorphic rocks that show gneissic foliation, and/or migmatization and recrystallization; fine- to coarse-grained, generally well-layered; commonly enclose recrystallized selvages of dark-green andesitic to basaltic rocks; composition of more coarse-crystalline, migmatitic rock is granodioritic; gneiss and migmatitic generally occupy linear zones between non-recrystallized Hulayfah group rocks and massive, unfoliated megmatitic and granodiorite</p> <p>SEDIMENTARY ROCKS UNDIVIDED--Medium-gray to tan limestone and silty limestone interlayered with felsic to intermediate volcanic flows, olive-green argillaceous sandstone, red and maroon sandy shale, shale, and minor conglomerate; commonly associated with brownish-tan to bluish-gray to black limestone and dolomitic limestone interlayered with lenses of silty, ferric limestone and dolomite and locally thin quartz sandstone</p> <p>Noncarbonate rock</p> <p>Carbonate rock</p> <p>ANDESITE/BASALT--Dark-green, aphanitic to fine-grained andesite, basalt, related volcanic breccia, and polymetamorphic conglomerate; layering is faint to well-developed, locally associated with fine-grained clastic sedimentary rocks and minor carbonate lenses of uncertain origin. Commonly associated with 1) medium-brownish-gray, medium- to coarse-crystalline, massive, dense, and non-layered carbonate rock 20-60 m thick that is, at least locally, clearly a replacement product of mafic volcanic and plutonic igneous rocks (hb); 2) light- to medium-gray, dense siliceous rock that may represent local siliceous or cherty lenses, commonly associated with breccia (hs); 3) greenish-black, dense, strongly sheared serpentine-rich rocks cut by veins of calcium carbonate and iron oxides (hsp)</p> <p>BASALT--Dark-greenish-black, dense, massive to weakly layered, basaltic volcanic rocks locally associated with layered conglomerate; basaltic rocks are commonly amygdaloidal, with vesicles filled with quartz, chlorite, and locally, calcite</p> <p>PLUTONIC AND IGNEOUS ROCKS</p> <p>RHYOLITE AND APLITE--Reddish-pink, porphyritic, generally leucocratic, felsic rocks that occur as small plugs and sills</p> <p>FELSIC DIKES AND SILLS--Pinkish-red to brown, aphanitic to aphanitic-porphyrific, mafic-poor dikes that range in composition from rhyolite to rhyodacite</p> <p>MAFIC DIKES--Dark-green, aphanitic-porphyrific dikes that range in composition from diorite to basalt</p> <p>DIORITE--Dark-green, fine-grained, porphyritic diorite containing euhedral phenocrysts of andesine as much as 3 cm in diameter, and locally hornblende prisms as much as 0.5 cm long</p> <p>MONZOGORANITE--Light-gray to pinkish-white, hypidiomorphic-inequigranular, coarse-grained, perthitic, and locally porphyritic, biotite-hornblende granite</p> <p>ALKALI-FELDSPAR GRANITE--Pinkish-gray, hypidiomorphic, inequigranular, coarse-grained, hornblende-bearing granite characterized mainly by pink, blocky, equant, potassium-rich feldspar crystals</p> <p>GRANOPHYRE--Pinkish to brick-red, coarse- to medium-grained granophyre that stands as elongate knobs and hills; composed of graphic intergrowth of potassium feldspar and quartz, orthoclase, oligoclase, quartz, and minor hornblende</p> <p>RHYOLITIC FLOWS AND SILLS--Pinkish-red to tan, complexly interlayered rhyolitic flows and locally overlain by rhyolitic volcanic rocks</p> <p>INTRUSIVE COMPLEX--Dark-green mafic to intermediate volcanoclastic rocks of the Hulayfah group complexly intruded by reddish-brown granitic and granophyric rocks and locally overlain by rhyolitic volcanic rocks</p> <p>GRANITE FELDMATTIE--White, very coarse crystalline quartz that contains pods of intergrown biotite and quartz; forms irregular shaped bodies as much as 1 km across</p> <p>QUARTZ DIORITE--Medium-gray, hypidiomorphic-euquigranular quartz diorite to diorite; contains abundant hornblende</p> <p>BIOTITE GRANODIORITE--Light-gray, medium- to coarse-grained, hypidiomorphic-inequigranular, granodioritic rock that contains biotite and, locally, muscovite</p> <p>HORNBLENDE GRANODIORITE--Light-gray, hypidiomorphic-euquigranular, medium- to coarse-grained, hornblende-bearing granodiorite that is cut by numerous mafic dikes</p> <p>DIORITE AND GABBRO--Dark-greenish-black to bluish-green, dense, massive, non-layered to finely layered, medium- to very coarse grained basalt, diorite, and gabbro intruded into hb; mainly basaltic rock crop out as low, irregular hills whereas coarse-grained sills and small plugs of diorite and gabbro stand out as resistant hills and elongate knobs; sills are locally so closely spaced as to appear as sheeted dike complexes intruded into the Hulayfah group rocks</p>	

RECONNAISSANCE GEOLOGIC MAP OF THE AR RAWDH QUADRANGLE, SHEET 26/40 D, KINGDOM OF SAUDI ARABIA

by
 J. M. O'Neill and D. C. Ferris
 1985